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THE IMPACT OF BONUS SCHEMES ON ACCOUNTING CHOICES

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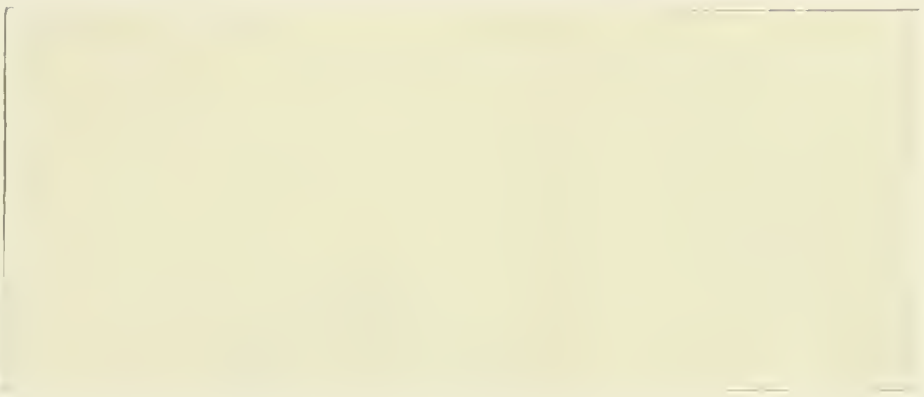

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ABSTRACT

Bonus contracts are a popular means of rewarding corporate executives. Awards under these contracts are conditioned on accounting earnings. If it is costly for administrators of bonus schemes to adjust earnings numbers for changes in accounting techniques, managers have an incentive to select procedures that increase the value of their awards. Available evidence on the relationship between the accounting procedures used to report earnings and the existence of an accounting-based compensation scheme is conflicting. However, this literature has largely ignored the structure of the compensation agreements; it has assumed that profit-sharing schemes induce the manager always to select income-inflating accounting procedures.

This paper identifies the common features of bonus plans. The relationship between accounting choice decisions and bonus plan parameters is examined assuming costly monitoring of accounting decisions. Conditional on the cash flows of the firm, managers are predicted to have an incentive to select income-increasing or income-decreasing accounting procedures. From these implications tests of the association between accounting choice decisions and the incentives created by accounting-based compensation schemes are constructed.

The results, using accruals as a proxy for the managers' accounting choice variable, are generally consistent with the theory. Managers appear to select accruals to increase the value of their bonus awards. Changes in inventory and receivables are identified as the accrual elements most strongly associated with managerial compensation incentives. Additional tests reinforce these results: managers are more likely to change accounting methods when a bonus plan is adopted or modified, than when there is no such contractual change.

1. INTRODUCTION

Recent research in accounting has sought to explain why managers select particular accounting procedures to report corporate financial performance. Compensation contracts, which condition awards on reported accounting earnings, have been widely-cited as one factor influencing managers' accounting choice decisions.[1] If it is costly for the administrators of these schemes to isolate the impact of accounting choices on earnings, managers have an incentive to select procedures that increase their bonus remuneration. Of course, if plan administrators have rational expectations, they anticipate this behavior, and ex ante fix managerial remuneration such that, after taking advantage of their control over the accounting system, the managers expect to earn only their opportunity wage.

The results of extant empirical tests of the association between the accounting procedures used to report earnings and the existence of an accounting-based compensation scheme are conflicting. However, these tests have largely ignored the structure of the compensation agreements; they have assumed that profit-sharing schemes induce the manager always to select income-inflating accounting procedures.[2]

This paper examines the structure of the most common form of explicit accounting-based remuneration - the bonus plan. The relationship between accounting choice decisions and the parameters of these bonus plans is examined and conditions under which managers have an incentive to select income-increasing or income-decreasing accounting procedures are identified.

To empirically test the implications of the model, a sample of compensation contracts is collected. Tests of the association between accounting choice decisions and management incentives, conditioned on the compensation plan, are constructed using actual plan parameters. Two proxies for the managers' accounting choice decisions are devised: accruals, defined as the difference between reported earnings and cash flows from operations; and disclosed changes in accounting procedures.

The accrual results are generally consistent with the compensation predictions. A strong association exists between accruals and management incentives, conditioned on bonus plan parameters. However, this evidence must be interpreted with caution. Accruals reflect both accounting procedure choices and non-accounting phenomena. For example, receivable accruals reflect changes in demand, a non-accounting phenomena, and accounting decisions related to the timing of revenue recognition. To control for these omitted (non-accounting) variables which may be correlated with the compensation incentives, the distributions of accruals for firms whose bonus plans include an upper bound are compared to the distributions of firms that do not have an upper bound. The results provide further support for the compensation hypothesis.

The results of change in accounting procedure tests are mixed. Managers are more likely to change accounting methods after a bonus plan is adopted or modified, than when there is no such contractual change. However, no strong association between accounting choices and annual management bonus incentives is observed. This result is not surprising. First, changes in accounting procedures afford managers less flexibility

to increase bonus awards than the decisions reflected in accruals. It is costly to change procedures from one year to the next, whereas such decisions as deferral or acceleration of sales recognition can be changed from one year to the next at lower cost. Secondly, the impact of changes in methods is typically publicly disclosed for the year of the change. Bonus plan administrators can then adjust for their effect on bonus awards at lower cost than for less visible accrual decisions. Finally, the impact of the accounting change on bonus income is only available for the year of the change; the proxy ignores the impact of future year's bonus awards.

The paper is organized as follows: Section 2 reviews the compensation literature while Section 3 outlines the provisions of bonus agreements. The relationship between accounting choice decisions and bonus plan parameters is summarized in Section 4. Section 5 describes the sample design and data collection. Section 6 reports the results of accrual tests of the compensation model while change in accounting procedure tests and results are described in Section 7. The conclusions are presented in Section 8.

2. REVIEW OF THE LITERATURE

Two areas of compensation research have been popularized in the literature. The first explains the design of compensation contracts. Ross (1973), Jensen and Meckling (1976) and Smith and Watts (1983) suggest that these schemes mitigate incentive problems encountered when the manager does not completely own the firm. Miller and Scholes (1981)

and Hite and Long (1980) offer an alternative, but not mutually exclusive, explanation: the schemes are designed to minimize the joint tax liabilities of the corporation and its managers.

The accounting literature has focused on a second area of research, the impact of compensation plans on accounting choices. When managers' rewards are conditioned on reported income they have an incentive to select accounting procedures to increase the value of their awards. Studies which have sought to test this hypothesis have adopted a standard methodology to account for the effect of compensation schemes on cross-sectional differences in accounting choice decisions.[3] A dummy variable, taking the value one if the corporation's management is rewarded on the basis of accounting earnings, and zero otherwise, is typically included as an explanatory variable in a probit or discriminant analysis model. The studies contend that managers rewarded on the basis of accounting earnings have an incentive to select accounting procedures to inflate that number.

There are, however, some important methodological problems associated with these studies:

(1) Failure to take account of whether the accounting issue in question is likely to have an impact on managerial bonuses. Hagerman and Zmijewski (1979), for example, analyze the corporate selection of methods of recording the investment tax credit. Alternative accounting procedures are classified as income-increasing or income-decreasing. Probit analysis is used to evaluate whether size, risk, capital intensity, concentration, and the existence of incentive compensation

plans affect the principles selected. However, half of the sample plans collected for this paper condition compensation awards on income before taxes. It is not surprising then that Hagerman and Zmijewski find no significant association between their compensation variable and the choice of investment tax credit methods. A similar problem is encountered by Bowen, Noreen and Lacy (1981), who examine the decision to capitalize interest, and by Watts and Zimmerman (1978), who investigate corporate lobbying on FASB Discussion Memorandum "Reporting the Effects of General Price Level Changes in Financial Statements." Compensation earnings are frequently defined before interest, and are typically based on historical cost records. The results of these studies therefore understate the association between compensation incentives and accounting choices.

(2) Failure to recognize that the form of compensation schemes creates an incentive for managers to select income-decreasing as well as income-increasing accounting procedures. The schemes examined in this study typically permit funds to be set aside for compensation awards when earnings exceed a specified target. This structure implies that, under certain conditions, managers have an incentive to select income-decreasing accounting techniques. For example, if earnings are so low that, no matter which accounting principles are selected, target earnings will not be met, the managers have an incentive to further reduce current earnings by deferring revenues or accelerating write-offs. This strategy is known as "taking a bath." While it reduces earnings for the present year, in which no additional funds are set aside

for compensation awards, it increases the probability of meeting future earnings targets.[4]

Existing empirical tests of the compensation hypothesis have not controlled for situations where managers have an incentive to select procedures which deflate, rather than increase, earnings. For example, as noted above, Hagerman and Zmijewski examine the decision to use the deferral or flow-through methods to record the investment tax credit. The deferral method decreases income relative to the flow-through method in the year of purchase of a fixed asset, and increases income in succeeding years. If managers of firms in the test sample can increase the value of their compensation awards by selecting income-decreasing accounting procedures, they will prefer the deferral to the flow-through method. Hagerman and Zmijewski predict that, at least for compensation purposes, the manager will always select the flow-through method. Their results therefore understate the impact of compensation incentives on the selection of investment tax credit procedures.

In summary, extant empirical studies ignore several important elements of compensation agreements in designing tests to evaluate the association between management incentives under these contracts and accounting choice decisions. This study analyzes the most common form of explicit accounting-based compensation contract, the bonus plan, thereby providing a potentially more powerful test of this association.

3. DESCRIPTION OF ACCOUNTING BONUS SCHEMES

A wide range of rewards is offered to top level corporate executives. Deferred salary payment, insurance plans, nonqualified stock options, restricted stock, stock appreciation rights, performance plans and accounting bonus plans are all common forms of compensation.[5] The objective of this research is to analyze the association between management compensation incentives and acccounting choices. Two of the above forms of remuneration are explicitly dependent upon accounting numbers: bonus schemes and performance plans.[6] Performance plans provide managers with long-term earnings targets, whereas bonus schemes specify annual earnings objectives.

Differences in the forms of these two schemes make it difficult to identify their combined effect on the managers' accounting decisions. This identification problem is mitigated by limiting the study to firms whose only form of remuneration explicitly related to accounting earnings is a bonus plan. The potential selection bias may not be as serious as it first appears. Bonus schemes are worthy of study in their own right. Fox (1980) finds that in 1974 only 8 percent of the one thousand largest U.S. manufacturing corporations employed performance plans. This percentage increased to 25 percent by 1980. In contrast, in 1980 90 percent of the sample used a bonus plan to remunerate managers. Bonus awards also tend to constitute a higher proportion of top executives' remuneration than performance payments. In 1978, for example, Fox reports that the median ratio of accounting bonus to base salary was 52 percent. The corresponding median ratio for performance awards was 34 percent.

The formulae and variable definitions used in bonus schemes vary considerably between firms, and even within a single firm across time. Nonetheless, some common features of these contracts are evident. They typically set a maximum percentage of reported earnings, after deducting a specified target, which is to be transferred to the management bonus pool. Annual allocations are made from the pool in recognition of individual performance. Unallocated funds may be available for future bonus payments. The plans are administered by a committee of directors who are ineligible to receive awards from the pool. The maximum allocation to the bonus pool (B_t) is:

$$B_t = p_t \, \text{Max}\{(E_t - L_t), 0\}$$

where p_t is a parameter henceforth termed the payout rate ($0<p_t<1$), and E_t is some variant of reported earnings, defined in the plan. The earnings target, or lower bound (L_t) is frequently specified as a percentage of either stockholders' equity or total assets.[7]

The 1980 bonus contract of Standard Oil Company of California, for example, defines the bonus transfer as follows:

> ...the annual fund from which awards may be made is two percent of the amount by which the company's annual income for the award year exceeds six percent of its annual capital investment for such year.

Standard Oil defines "annual income" as audited net income before the bonus expense and interest, and the "capital investment" as the average of opening and closing book value of long-term liabilities plus equity.

Variations in these definitions are found in other companies' plans. Earnings are defined before or after interest, the bonus expense, taxes, extraordinary and nonrecurring items, and/or preferred dividends. "Capital investments" are an average of the annual, quarterly or monthly book value of equity, or long-term debt plus equity (both at book value). Equity alone is used to define capital when income for incentive purposes is after interest; the sum of long-term debt and equity is adopted when earnings are defined before interest.[8] The lower threshold thus has the effect of permitting awards only when income exceeds some minimum return on equity and debt financing.

Other features of the plan also warrant mention. Some schemes specify an upper bound (U_t) on earnings. When earnings (net of the lower bound) exceeds the upper bound, the excess ($E_t - L_t - U_t$) is excluded from bonus calculations. The upper bound is commonly related to cash dividend payments on common stock.[9] The maximum allocation to the pool (B'_t) then takes the following form:[10]

$$B'_t = p_t\{\text{Min } \{U_t \text{ , Max } \{(E_t - L_t), 0\}\}\} \qquad (3.1)$$

The 1980 bonus contract for Gulf Oil Corporation, for example, limits the transfer to the bonus reserve in any year to six percent of net earnings which exceeds six percent of capital employed, "provided that the amount credited to the Incentive Compensation Account shall not exceed ten percent of the total amount of the dividends paid on the corporation's stock."

Bonuses allocated from these reserves take the form of cash, stock, stock options or dividend equivalents.[11] Many plans provide for the deferral of awards, either at the discretion of the compensation committee or the individual manager. The payments, for example, may be deferred for as many as five years or distributed throughout those years.

4. BONUS PLANS AND ACCOUNTING CHOICE DECISIONS

This section analyzes the relationship between accounting choices and bonus plan parameters. Given the standard features of bonus contracts described in Section 3, in particular, the upper and lower bounds on earnings, a strategy is derived to maximize the value of the managers' bonus awards.

As noted in Section 2, compensation contracts have typically been rationalized as a control mechanism which mitigates the conflict of interest between the owners and managers of a firm. However, bonus contracts can also create dysfunctional incentives. If it is costly for bonus plan administrators to adjust for accounting effects, managers have an incentive to select procedures which increase the present value of their awards.[12]

A variety of control mechanisms exist to limit the managers' incentives to manipulate earnings. The audit committee and external auditor provide one form of control over accounting choices used to report income. In addition, the compensation committee has discretion to ex post adjust earnings for accounting effects when computing bonus

awards. Finally, Fama (1980) points out that the managerial labor market provides a low cost form of implicit monitoring which mitigates the managers' conflict of interest. Failure to select those accounting procedures which maximize stockholders' wealth are penalized by the labor market by reduction of the managers' future compensation.

While internal policing of accounting choices by the compensation and audit committees, and external monitoring by the outside auditor and managerial labor market limit the managers' incentives to select accounting procedures for bonus purposes, they are unlikely to completely eliminate those incentives.[13] For example, the internal and external auditors are responsible for evaluating the corporation's system of internal control and for reporting whether accounting procedures used to measure income conform to generally accepted accounting practice. The auditors thus limit the accounting technology available to report earnings, but managers can still select accounting procedures to report earnings which satisfy the auditing constraints. Frequently cited examples of these forms of adjustment include depleting LIFO inventory layers, and deferring or accelerating recognition of sale of finished goods at year end.

Holmstrom (1982) analyzes the impact of implicit contracts on managerial behavior. In particular, he examines Fama's assertion that market forces alone discipline incentive problems. Holmstrom concludes that Fama's proposition is correct, but only under certain restrictive assumptions: "risk-aversion and discounting place obvious limitations on the market's ability to police incentives."[14] The existence of

implicit contracts provided by the labor market, or arising between compensation administrators and managers, therefore constrains, but does not necessarily eliminate, the managers' incentives to use accounting techniques to increase their bonus awards. The accounting decision rule derived in this section assumes that internal and external control mechanisms limit the managers' accounting choice variable to an amount K.

The bonus plan formula examined is identical to the most general form presented in equation (3.1), specifying both an upper and lower bound.

$$B'_t = p_t\{\text{Min}\{U_t, \text{Max}\{(E_t - L_t), 0\}\}\}$$

where $(U_t + L_t)$ and L_t are the upper and lower bounds on earnings (E_t) respectively, and p_t is the payout rate. The decision rule derived for plans taking this form can be readily adapted to yield an equivalent strategy for plans which specify only a lower bound.

To simplify the problem the following assumptions are made:

(1) The contracting parties, collectively known as the firm, are comprised of a single risk-averse manager, and one or more owners.

(2) The manager's time horizon with the corporation is two periods.[15]

(3) The manager is permitted to modify only the <u>timing</u> of income reporting. Further, he can only transfer earnings to and from periods within his time horizon with the firm. This implies that the time series of accounting choices over this horizon sum to zero.

(4) The administrators of the plan follow the formula written in the contract even though they have discretion to award less than the amount so specified.

(5) The upper and lower bounds on earnings and the payout rate, specified in the bonus contract, are intertemporal constants.

(6) The bonus pool is allocated in full each year.

(7) If payments from the bonus pool are deferred, the cash saving is used to repurchase the company's stock. The deferred payments are then financed by reissuing treasury stock.[16]

(8) The production/investment decisions of the firm are independent of accounting choices.[17]

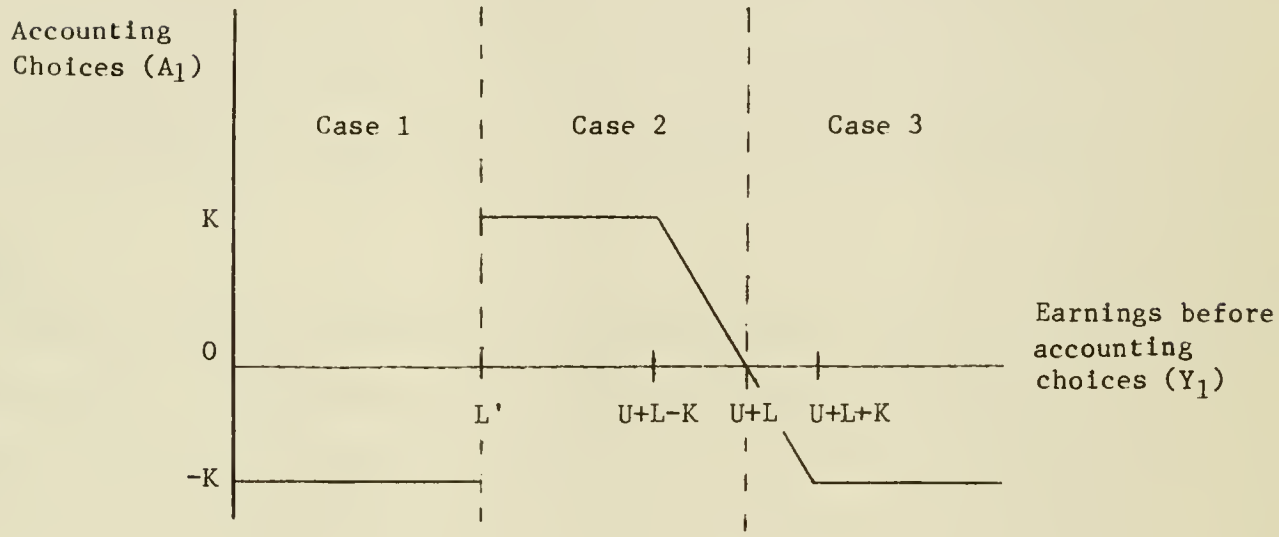
The manager observes earnings prior to accounting choices (Y_t) at the end of each period. Conditional on this value he makes an accounting choice (A_t) to maximize his expected utility from bonus awards.[18] His decision rule is derived in detail in Healy (1983) and is depicted graphically in Figure 4.1. For expositional purposes, discussion of the decision rule is decomposed into three cases.[19]

Case 1

Figure 4.1 indicates that, within the range $Y_1 < L'$, the manager maximizes the present value of his bonus by selecting the minimum accrual ($A_1 = -K$). The most obvious illustration of this strategy arises when $Y_1 < (L-K)$. In this event, even if he selects the maximum accounting adjustment, reported income will not exceed the lower bound and no bonus will be awarded. By deferring earnings to period two, the manager maximizes his expected future award.

Figure 4.1

Managerial Accounting Choice Decisions as a Function of Income before Accounting Choices and Bonus Plan Parameters



When period one earnings are within ±K of the lower bound the manager weighs present value and certainty advantages of receiving a bonus in period one against the accompanying foregone expected bonus in period two. Conditional on the bonus plan parameters, the distribution of earnings before accounting choices in period two, the discount rate, and the manager's level of risk aversion, a cutoff point (denoted by L' in Figure 4.1) exists where the manager is indifferent between selecting the minimum and maximum accrual. When $Y_1 < L'$ the manager maximizes his expected utility by selecting $A_1 = -K$, that is, by "taking a bath".

Case 2

When first period earnings before accounting choices exceed the cutoff point L' the manager selects a positive accrual. The present value and certainty advantages of accelerating income and receiving a bonus in period one outweigh foregone expected awards in period two. Of course, the manager never chooses accruals which increase reported earnings beyond the upper limit because that income is lost for bonus purposes. When earnings before accounting choices are within K of the ceiling, the manager selects income-increasing accounting procedures, but less than the maximum. He chooses $A_1 = (U + L - Y_1)$, thereby reporting earnings after accruals equal to the upper bound.

Case 3

When earnings before accounting choices exceed the upper bound defined in the bonus plan, the manager selects income-deflating

accounting procedures. By deferring income which exceeds the upper bound, the manager does not reduce his current bonus and increases his expected future award. The manager does not defer income below the upper bound; to do so decreases the value of his period one bonus more than the accompanying increase in value of his expected future awards. He defers pre-accounting earnings which exceed the upper bound up to the limit of -K.

In summary, the sign and magnitude of accounting choices is predicted to be a function of the distribution of earnings,[20] the parameters of the bonus plan, the monitoring technology available to plan administrators (represented by the limit on accounting choices), the risk preference of the manager, and the discount rate. Three implications for accounting choice are tested in the following sections of the paper.

(1) If earnings before accounting choices are less than the threshold represented by L', the manager has an incentive to "take a bath," that is to select the minimum feasible accounting decision variable. He earns no bonus this period but can increase his expected future payoffs by transferring income to succeeding periods.

(2) If earnings prior to accounting choice decisions exceed the lower threshold, denoted by L' in Figure 1, but not the upper bound, the manager has an incentive to select accounting procedures to inflate income. The resulting increase in his current bonus exceeds the value of foregone future awards.

(3) If earnings before accounting choices exceed the upper bound, defined in the bonus contract, the manager has an incentive to select procedures to deflate income. Earnings exceeding the upper bound are lost for compensation purposes. The manager can increase his expected future bonus by transferring as much of that difference as possible to succeeding periods.

If an upper bound is excluded from the bonus formula, the third hypothesis does not apply. Hypotheses one and two are still relevant.

5. SAMPLE DESIGN AND COLLECTION OF FINANCIAL DATA

An outline of the sample design is provided in Section 5.1 while Section 5.2 discusses the financial data collection.

5.1 Sample Design

The population selected for this study is composed of companies listed on the 1980 Fortune Directory of the 250 largest U.S. industrial corporations.[21] Copies of bonus plans are available for many members of this population in proxy statements. It is common for stockholders to endorse the implementation of a bonus plan at the annual meeting. Subsequent plan renewals are also ratified, usually every three, five or ten years and a copy or summary of the plan is included in the proxy statement on each of these occasions.

The earliest available copy of the bonus plan is collected for each company from proxy statements at one of three sources: Peat Marwick Mitchell and Company, the Citicorp Library and the Baker Library, Harvard

Business School. Plan information is updated whenever changes in the plan parameters are ratified.

One hundred and twenty-nine companies are excluded from the final sample. The managers of 123 of these firms are compensated by a combination of salary and bonus, but the details of the bonus contracts are not publicly available. Only six companies do not appear to reward top management by bonus awards during any of the years proxy statements are available. Sixty-one of the 121 companies included in the sample do not report the existence of a bonus plan in the first available proxy statement - they are included in the sample at a later date, following the first ratification of a bonus plan at the annual meeting.

One further sample restriction is imposed: companies are excluded from the sample during years that bonus and performance plans are concurrently in operation. Performance contracts, which are also written in terms of accounting earnings, provide the manager with additional compensation factors to consider when selecting accounting procedures. These are not incorporated in formulating the manager's decision rule derived in Section 4. Excluding these observations from the sample increases the power of the tests. This restriction does not eliminate any companies from the sample but reduces the number of time series observations available by 239 during the years 1974 to 1980, when many performance plans are first implemented.[22]

Thirty of the companies included in the final sample have bonus plans which specify both upper and lower bounds on earnings. A further twenty-seven have contracts which limit the transfer to the bonus pool to

a percentage of the participating employees' salaries. That information is not publicly disclosed; no upper limit can therefore by estimated for these sample observations. The twenty-seven companies are included in the sample but are recorded as if no upper bound has been specified.[23] The implications of this decision are examined later.

The usable definitions of earnings, the upper and lower limit and the payout formulae are recorded. Table 5.1 presents a summary of the alternative definitions noted and their incidence. The definitions are not necessarily mutually exclusive. For example, the 1975 bonus contract of American Home Products Corporation defines the lower bound as "the greater of (a) an amount equal to 12 percent of Average Net Capital or (b) an amount equal to $1.00 multiplied by the average number of shares of the Corporation's common stock outstanding at the close of business on each day of the year."

5.2 Collection of Financial Data

The first task of data collection is to estimate earnings, and the upper and lower bounds using actual definitions specified in each company's plan.[24] As noted above, these definitions are updated whenever the plan is amended. The data required to compute these variables is collected from COMPUSTAT for the years 1946-80 and from Moody's Industrial Manual for earlier years.

The next task is to select a proxy for the managers' accounting choice decision. Two empirical analogues for accounting choice decisions are proposed. The first is a variant of accruals. Accruals are the difference between reported accounting earnings and cash flows from

Table 5.1

Summary of Bonus Plan Definitions

Total number of sample companies	121
Total number of cross-sectional, time series observations	1923
Number of sample observations subject to an upper bound constraint	446

Earnings definition	Number of Observations
Additions to net income	
Income tax	1014
Extraordinary items	529
Interest	644
Deductions from net income	
Preferred dividends	233
Lower bound definition	
Parameters of the lower bound	
Net worth	308
Net worth plus long-term liabilities	715
Earnings per share	159
Other	342
Upper bound definition	
Parameters of the upper bound	
Dividends	431
Net worth or net worth plus long-term liabilities	49
Other	87

operations. Cash flows are defined as working capital from operations (as reported in the funds statement) less the changes in inventory and receivables, plus the changes in payables and income taxes payable. Accruals (ACC) are then computed as:

$$ACC_t = -DEP_t - XI_t \cdot D_{1t} + AR_t + INV_t - AP_t - \{TP_t + DEF_t\} \cdot D_{2t} \qquad (5.1)$$

where, DEP_t = depreciation in year t

XI_t = extraordinary items in year t

AR_t = accounts receivable in year t less accounts receivable in year t-1

INV_t = inventory in year t less inventory in year t-1

AP_t = accounts payable in year t less accounts payable in year t-1

TP_t = income taxes payable in year t less income taxes payable in year t-1

DEF_t = deferred income tax expense (credit) for year t

D_1 = { 1 if bonus plan earnings are defined after extraordinary items; 0 if bonus plan earnings are defined before extraordinary items

D_2 = { 1 if bonus plan earnings are defined after income taxes; 0 if bonus plan earnings are defined before income taxes

The only potentially material subcomponent of accruals omitted from equation (5.1) is the impact of equity accounting on earnings. Accruals reflect such accounting decisions as deferral or acceleration of sales recognition, inventory write-downs, capitalization or expense of repair

expenditures, changes in estimated salvage values or lives of depreciable assets, and publicly disclosed changes in accounting procedures.

Accruals for each year are standardized by the book value of total assets at the end of that year.[25] Positive standardized accruals are classified as income-increasing, and negative values are recorded as income-decreasing accounting choices.

One limitation of using transformed accruals as a proxy for the managers' decision rule is that they reflect non-accounting phenomena, such as changes in physical inventory levels and demand, as well as accounting choices. The second empirical proxy, one which unambiguously reflects accounting choice decisions, is the effect of voluntary changes in accounting procedures on earnings.

Reported changes in accounting procedures are collected for the above sample from two sources: the sample of depreciation changes employed in Holthausen (1981) and changes documented by Accounting Trends and Techniques from 1968 to 1980. The impact of each change on earnings and other accounting numbers is collected from the company's annual reports. This data is described in more detail in Section 7.

6. ACCRUAL TESTS AND RESULTS

The hypotheses outlined in Section 4 are derived in a world where managers are able to select accounting procedures, up to some limit, without being detected by bonus plan administrators. Tests of these hypotheses provide a means of assessing the cost of monitoring the managers' accounting decisions. Costly monitoring, given the above model

of accounting choices, implies that reported earnings and accounting decision variables will be related in a predictable manner. If monitoring is costless no such association will be observed.

Analysis of the data is divided into two sections: (1) contingency tests, and (2) tests comparing the distributions of accruals for firms whose bonus plans include an upper bound to the distributions of firms that do not have an upper bound.

6.1 Contingency Tests

Contingency tables are constructed to test the predictions of the compensation model. A higher than normal incidence of negative accruals is expected when the upper and lower constraints, defined in the bonus plan, are binding.

The upper bound is binding when earnings before accounting choice decisions exceed the plan upper limit. One difficulty with this classification strategy is that earnings before accounting choices are unknown. Cash flows from operations (earnings before all accruals) are used instead. If in a given year a corporation's cash flows from operations exceed the upper bound specified in the bonus contract, that cross-sectional, time-series observation is assigned to a portfolio henceforth labelled UPP.

The lower bound is binding when earnings before accounting decisions are less than the lower threshold, represented by L' in Figure 4.1. An additional difficulty complicates classification of these observations; both earnings before accounting choice decisions and the lower threshold

are unobservable. The threshold is a function of the managers' risk preferences and their expectations of future earnings. An alternative means of identifying these observations is adopted. When reported earnings (net of all accruals) are less than the lower bound no bonus is awarded. Managers have then had an incentive to defer income. This ex post interpretation of the managers' decision rule is used to further partition the sample. Observations are assigned to a portfolio, labelled LOW, if reported earnings in a given year, after all adjustments required by the bonus plan, are less than the lower bound defined in the plan.[26]

Observations which are not assigned to either Portfolio UPP or Portfolio LOW form the remaining portfolio, labelled MID. This category comprises those cross-sectional, time-series observations for which neither the upper nor lower limit is binding. A higher incidence of positive accruals is expected for this portfolio than for Portfolios LOW and UPP.

The relative incidence of positive and negative accruals for the three portfolios is presented in the form of a contingency table in Table 6.1. The row denotes the portfolio to which each earnings observation is assigned, conditional on the bonus plan parameters, the column denotes the sign of the accrual and each cell contains the proportion of observations fulfilling each condition. Mean standardized accruals are also displayed for each portfolio.

Two test statistics are reported: Chi-Square and t statistics. The Chi-Square statistic compares the number of observations in each cell with the number expected given the marginal frequencies.[27] The test is

Table 6.1

Summary of the Association between Accruals and Bonus Plan Parameters

Sample A: Plans with a Lower Bound but No Upper Bound

Portfolio	Proportion of standardized accruals signed		No. of Observations	Mean Standardized Accrual	t Test for Difference in Means
	Positive	Negative			
Portfolio LOW	0.30	0.70	135	-0.0405	
					3.8376[1]
Portfolio MID	0.34	0.66	1342	-0.0158	
X^2 (d.f. = 1)	1.2645				

Sample B: Plans with Both a Lower Bound and Upper Bound

Portfolio	Proportion of standardized accruals signed		No. of Observations	Mean Standardized Accrual	t Test for Difference in Means
	Positive	Negative			
Portfolio LOW	0.05	0.95	21	-0.0703	
					3.9034[1]
Portfolio MID	0.46	0.54	278	0.0047	
					7.0315[1]
Portfolio UPP	0.12	0.88	147	-0.0522	
X^2 (d.f. = 2)	57.0988[1]				

Sample C: Aggregate of Samples A and B

Portfolio	Proportion of standardized accruals signed		No. of Observations	Mean Standardized Accrual	t Test for Difference in Means
	Positive	Negative			
Portfolio LOW	0.12	0.88	156	-0.0445	
					5.3370[1]
Portfolio MID	0.36	0.64	1620	-0.0122	
					7.1240[1]
Portfolio UPP	0.26	0.74	147	-0.0522	
X^2 (d.f. = 2)	39.4107[1]				

[1]Significant at the .005 level.

a two-tailed test. A significant statistic leads to rejection of the null hypothesis for one of two reasons: (1) the results are consistent with the compensation model, or (2) the incidence of positive and negative accruals differs from that expected under the null hypothesis, but in the opposite direction to the predictions of the compensation model. Student t statistics are reported to test differences in mean standardized accruals for the three portfolios. A positive test statistic indicates that the difference in means is consistent with the predictions of the compensation model; a negative value implies it is inconsistent with the theory. The t test is a one-tailed test.[28]

Sample A reports results for plans with a lower bound, but no upper bound. There are more negative accruals than expected under the null hypothesis when the lower limit is binding (Portfolio LOW) and otherwise more positive accruals (Portfolio MID). No observations are assigned to Portfolio UPP because these plans do not specify an upper bound. The Chi-Square statistic is not statistically significant. The mean standardized accruals provide stronger evidence of a compensation effect. The mean for Portfolio LOW is negative and less than the mean for Portfolio MID and the t statistic, comparing the difference in these means, is statistically significant at the .005 level.

As mentioned earlier, Sample A includes 27 companies whose plan specifies an upper bound, but where that limit is a function of participating employees' salaries. If these upper constraints are binding, observations for these companies are misclassified. If anything, this problem increases Type II eror, that is the probability of failing to reject the null hypothesis when it is false.[29]

Sample B comprises plans which specify both an upper and lower bound. The Chi-Square statistic, comparing the reported number of observations in each cell with the number expected, is significant at the .005 level. There are more negative accruals than expected when the lower and upper limits specified in the bonus plan are binding. The mean standardized accruals reinforce the Chi Square results; the means for Portfolios LOW and UPP are less than the mean for the MID portfolio. The t tests, evaluating differences in these means, are statistically significant at the .005 level. The final sample aggregates and also confirms the previous results.

There are several differences in the results reported for Samples A and B. Firstly, the results for the MID portfolio are stronger for the sample of plans with upper bounds. One potential explanation for this result is that bonus plan administrators enforce an informal upper bound when one is not specified in the contract. If this informal upper bound is binding, some of the companies included in the MID portfolio for Sample A are misclassified; they should be included in Sample B and assigned to portfolio UPP. A second difference between the samples is the stronger result for the LOW portfolio, again when plans include an upper bound. No explanation for this difference is offerred.

Contingency tables are also constructed for the various subcomponents of total accruals to identify those most closely associated with the bonus plan parameters. Total accruals are decomposed into the following elements: changes in inventory, changes in receivables, depreciation, changes in payables and, where relevant to the bonus award, changes in

income taxes payable. These subcomponents are standardized by total assets.

The changes in inventory and receivable accrual subcomponents are most strongly associated with management compensation incentives. Contingency tables for these two subcomponents are presented, with Chi Square and t statistics for the aggregate sample in Table 6.2[30] There are more negative inventory and receivable accruals than expected by chance when the upper and lower constraints are binding and more positive accruals than expected otherwise. The Chi-Square statistics are significant at the .005 level. The portfolio means also reflect the observed association: mean inventory accruals for Portfolios UPP and LOW are significantly lower than the mean for Portfolio MID at the .005 level.

In summary, the evidence in Table 6.1 and 6.2 is consistent with the hypothesis that the accounting procedures adopted to report income are not independent of management compensation incentives. When the upper and lower bounds specified in bonus contracts are binding, more accruals are negative than expected. When these constraints are not binding, more accruals are positive than expected. The contingency tables for decomposed accruals identify changes in inventory and accounts receivables as the accrual subcomponents responsible for this association. The results are consistent with the implications of the compensation hypotheses presented in Section 4.

There are several limitations of the tests reported above. First, the method of assigning observations to Portfolio LOW induces a form of selection bias. Observations are asssigned to Portfolio LOW when

Table 6.2

Summary of the Association between Accrual Subcomponents and Bonus Plan Parameters

Change in Inventory

Portfolio	Proportion of standardized accruals signed		Mean Standardized Accrual	t Test for Difference in Means
	Positive	Negative		
Portfolio LOW	0.70	0.30	0.0057	
				4.4239[1]
Portfolio MID	0.81	0.19	0.0244	
				4.0949[1]
Portfolio UPP	0.58	0.42	0.084	
X^2 (d.f. = 2)	51.4790[1]			

Change in Accounts Receivable

Portfolio	Proportion of standardized accruals signed		Mean Standardized Accrual	t Test for Difference in Means
	Positive	Negative		
Portfolio LOW	0.33	0.67	0.0069	
				4.1299[1]
Portfolio MID	0.83	0.17	0.0215	
				2.6933[1]
Portfolio UPP	0.60	0.40	0.0135	
X^2 (d.f. = 2)	54.7313[1]			

[1]Significant at the .005 level.

reported earnings are less than the lower bound. However, accruals are a subcomponent of reported earnings. Even if accruals are independent of cash flows from operations, partitioning observations on the basis of reported earnings induces a spurious association between the portfolio assignments and accruals. Portfolio LOW tends to comprise observations with both low earnings and low accruals. It is difficult to exclude the possibility that the significant test statistics for Portfolio LOW are induced by the portfolio construction procedure. This interpretation does not arise for the results reported for Portfolio UPP because the earnings variable used to assign observations to that subsample is cash flows from operations, rather than reported income. As noted above, cash flows from operations are not used to classify observations to Portfolio LOW because the lower threshold is unobservable.

A second potential problem arises from errors in measuring the proxies for earnings before accounting choices and accounting choices themselves. Cash flows from operations are used as a proxy for earnings before accounting choices, and accruals as a proxy for the choice itself. Measurement errors for these variables are perfectly negatively correlated because the sum of accruals and cash flows from operations, by definition, equals reported earnings. A positive measurement error for accounting choices implies that there is a corresponding negative error in measuring earnings before accounting choices. The impact of these measurement errors on the Chi-Square statistic is ambiguous: they could potentially confound or magnify any compensation effect.

An additional test is designed to control for the impact of measurement error on the results for Portfolios MID and UPP. The distribution of accruals for firms whose plans include an upper bound, conditioned on cash flows from operations, is compared to the distribution of accruals for firms with no upper bound. The results are reported in Section 6.2.

Even if the above limitations are not serious, there is a third potential explanation of the observed association between accruals and the bonus plan parameters. Accruals reflect a combination of factors: non-accounting phenomena, prior and current years' accounting decisions by management, and accounting procedures prescribed by standard-setting bodies (e.g. the Securities Exchange Commission and the Financial Accounting Standards Board). For example, inventory accruals reflect non-accounting factors, such as changes in physical inventory levels.[31] They also reflect accounting procedures adopted to value inventory, such as fixed overhead allocations and cost flow assumptions (LIFO, FIFO, etc.).

The impact of prescriptions by standard-setting bodies on accruals are assumed to be independent of the predictions of the compensation model. However, little is known of the impact of non-accounting events, such as changes in demand, on cash flows and accruals. It is therefore difficult to preclude the possibility that non-accounting events induce an association between accruals and cash flows from operations similar to that predicted by the compensation model. For example, if there is an unexpected increase in demand, physical inventory levels might be

expected to fall and cash flows from operations increase, consistent with the reported results for Portfolio UPP. Of course, applying an analagous argument, an unexpected decrease in demand might be expected to increase physical inventory levels and decrease cash flows from operations, exactly the opposite to the compensation model predictions for Portfolio LOW.

The tests presented in Section 6.2 are designed to control for potential omitted variables (such as non-accounting effects) which are correlated with compensation incentives. The distribution of accurals for firms whose bonus plans include an upper bound, conditioned on cash flows from operations, is compared to the conditional distribution for firms with no upper bound. A second series of tests, which uses changes in accounting procedures as a proxy for the managers' decision variable, also provides a means of evaluating whether the results presented in this section are induced by correlated omitted variables, or reflect a compensation effect.

6.2 Comparison of Accrual Distributions for Sample Plans With and Without Upper Bounds

One way to control for the potential impact of measurement error noted above, and for omitted variables (such as non-accounting factors) which may be correlated with accruals and bonus plan incentives, is to compare the distribution of accruals for firms whose bonus plans include an upper bound to accrual distributions for firms with no such plan limit. This test avoids the limitations of the contingency tests by using the sample of firms whose bonus plans exclude an upper bound to

control for omitted variables correlated with accruals and cash flows from operations. The measurement error between accruals and cash flows from operations is also reduced because accruals are conditioned on a proxy for the error, cash flows.

As noted in Section 4, when the limits on earnings specified in the bonus contract are not binding, managers have an incentive to select income-increasing accounting procedures regardless of whether their contract includes an upper bound. In contrast, when their bonus contract includes an upper bound and that limit is triggered, managers are predicted to choose income-decreasing accounting procedures, whereas managers compensated by schemes with no ceilings on earnings continue to select income-increasing accruals. This implies that, conditional on cash flows from operations, accruals are lower for the upper bound sample when the ceiling is binding, than for firms whose plans exclude an upper bound.

A second difference between the two samples is also anticipated. As noted above, ceteris paribus, firms whose bonus plans include an upper bound are expected to report relatively more negative accruals when that ceiling is binding, than firms with no upper limit. This paper assumes that accounting choices affect only the timing of reported earnings. The higher incidence of negative accruals, when the upper constraint is binding, is then offset by relatively more positive accruals otherwise. This implies that, conditional on cash flows from operations, accruals are expected to be higher for the upper bound sample when the ceiling is not binding, than for firms whose plans do not include an upper bound.

If potential omitted variables (such as non-accounting phenomena) are independent of the inclusion of an upper limit in the bonus contract,

tests which compare the distribution of total accruals, conditional on cash flows from operations, for firms whose plans include and exclude an upper bound, isolate differences in accounting choice decisions. These tests also control for the measurement error problem associated with Portfolio UPP and MID results by conditioning accruals on a proxy for the measurement error, cash flows from operations.

The test design employed previously is modified in one important respect to compare the distribution of accruals for firms whose plans include and exclude an upper bound. The 27 companies which had an upper limit written in terms of participating employee's salaries are excluded from the sample. In Section 6.1 they are included in the sample of firms whose plans have no upper bound. Failure to delete these companies would lead to potential misclassifications which would reduce the power of the tests.

A pooled cross-sectional and time-series multiple regression is estimated using all observations for which earnings exceed the lower bound (Portfolios MID and UPP). The regression is esimated in the following form:

$$ACC_{it} = \beta_o + \beta_1 CF_{it} + \beta_2 CF_{it}^2 + \beta_3 D_{1it} + \beta_4 D_{2it} + u_{it} \quad \text{for all i, t}$$

The dependent variable in this regression is standardized accruals (ACC). Accruals are conditioned on cash flows from operations by including standardized cash flows as an independent variable. Cash flows (C) are standardized by subtracting the lower bound (L) and then deflating by that bound ((C - L)/L). The standardized measure, denoted by CF, reflects the relative proximity of cash flows to the lower bound.

Two dummy variables are constructed to compare the distribution of accruals for bonus plans which include and exclude and upper bound. The first (D_1) reepresents the marginal difference between accruals for plans with and without an upper bound, when that limit is binding. The dummy is assigned the value one if the upper bound is binding, and zero otherwise. The compensation model predicts that, conditional on cash flows, accruals will be lower for the upper bound sample when the ceiling is binding, than for firms whose plans exclude an upper bound. The second dummy variable (D_2) reflects the marginal difference between accruals for plans with and without upper bounds, when the ceiling is not binding. The variable receives a value one when the upper limit is not binding for the upper bound sample, and zero otherwise. This dummy provides a test of the second compensation prediction: accruals will be higher for the upper bound sample when the ceiling is not binding, than for comparable observations for firms whose plans do not formally include an upper limit.

The coefficient on standardized cash flows reflects the association between accruals and cash flows induced by (a) the bonus plan, (b) omitted variables (such as non-accounting effects), or (c) the errors in measuring earnings before accounting choices and the choices themselves. The regressions are estimated with both linear and quadratic standardized cash flow terms. The coefficients on the dummy variables estimate the marginal impact of including an upper bound in the bonus contract on mean accruals.[33] The compensation hypothesis predicts that the coefficient on the first dummy will be negative, representing the managers' incentive

to deflate earnings when the upper bound is binding. The coefficient on the second is predicted to be positive; if accruals affect only the timing of reported earnings, a higher incidence of negative accruals when the upper bound is binding will be offset by relatively more positive accruals otherwise. The regression is estimated for total accruals and also for inventory and receivable subcomponents. The results are presented in Table 6.3.

The coefficients on the dummy variables are insensitive to inclusion of the quadratic term on standardized cash flows from operations. The coefficient on the first dummy variable has the predicted negative sign and is statistically significant at the 0.005 percent level for accruals and the two accrual subcomponents, inventory and receivables. The coefficients on the second dummy variable are positive, and statistically significant at the 0.005 percent level for accruals and the inventory subcomponent. The receivable coefficient has the opposite sign to that predicted but is not significantly different from zero. These results generally support the compensation hypothesis: addition of an upper bound to the compensation contract induces managers to deflate income relative to managers whose plan includes no such bound, when the limit is binding. To offset this timing difference, there are higher mean accruals for firms whose plans include an upper bound than for those with no such constraint when the ceiling is not binding.

The linear coefficients for standardized cash flows from operations are consistently negative and statistically significant at the 0.005 percent level. These results are consistent with the predicted perfect

Table 6.3

Pooled Cross-Sectional and Time-Series Regression Comparing the Distribution of Standardized Accruals for Firms whose Bonus Plans Include and Exclude an Upper Bound (when the Lower Bound is not Binding)

$$ACC_{it} = \beta_0 + \beta_1 CF_{it} + \beta_2 CF_{it}^2 + \beta_3 D_{1it} + \beta_4 D_{2it} + u_{it}$$

	$\hat{\beta}_0$	$\hat{\beta}_1$	$\hat{\beta}_2$	$\hat{\beta}_3$	$\hat{\beta}_4$	Adjusted R^2	F Statistic (p level)
Predicted Sign				-	+		
Accruals							
	0.0114	-0.0155	0.0004	-0.0277	0.0131	0.4352	225.7790
	(5.44)	(27.5)	(10.62)	(-6.17)	(3.54)		(0.005)
	0.0125	-0.0138		-0.0290	0.0145	0.3810	240.4370
	(5.70)	(-24.4)		(-6.19)	(3.75)		(0.005)
Accrual subcomponents:							
Inventory							
	0.0395	-0.0092	0.0003	-0.0097	0.0069	0.3392	150.7710
	(26.7)	(-23.1)	(9.19)	(-3.09)	(2.64)		(0.005)
	0.0402	-0.0081		-0.0106	0.0078	0.2918	016.2960
	(26.3)	(-20.6)		(-3.25)	(2.87)		(0.005)
Receivables							
	0.0301	-0.0044	0.0001	-0.0055	-0.0027	0.1563	55.0415
	(26.1)	(-14.4)	(4.32)	(-2.25)	(-1.35)		(0.005)
	0.0303	-0.0041		-0.0058	-0.0024	0.1435	66.1520
	(26.2)	(-13.7)		(-2.36)	(-1.19)		(0.005)

t statistics in parentheses

negative correlation between measurement errors in the proxy for accounting choices (accruals) and the proxy for earnings before those choices (cash flows). They could also reflect omitted variables which are correlated with accruals and managerial compensation incentives. The quadratic terms are positive and are also significant at the .005 level.

In summary, the distribution of accruals differs for samples of firms whose plans include and exclude an upper bound. These statistical differences are generally consistent with the hypothesis that managers use accounting variables to increase the value of their bonus awards.

7. CHANGES IN ACCOUNTING PROCEDURE TESTS AND RESULTS

As noted in Section 5, a second proxy for the managers' accounting choice variable, voluntary changes in accounting procedures, is also used to test the implications of the compensation model. The proxy used in Section 6, accruals, reflects both accounting and non-accounting phenomena. Changes in accounting procedures reflect accounting choices alone, thereby increasing the power of the tests.

There are also three limitations of using changes in accounting procedures, rather than accruals, as a proxy for the managers' decision variable. These limitations reduce the power of the tests.

(1) Voluntary procedure changes are highly visible: their impact on reported earnings and other accounting numbers for the year of the change is typically publicly disclosed in the financial statement footnotes. If

administrators adjust for these accounting effects when computing bonus awards, managers will employ less visible accounting means to increase their bonuses. The effects of these other means are captured in the accrual proxy.

(2) Casual evidence suggests that it is more costly to implement the decision rule presented in Section 4 by changing accounting procedures than by changing accrual decisions. Companies rarely change accounting procedures on an annual basis - for example, changes to straight line depreciation in one year are typically not followed by a change to other depreciation methods in succeeding years. Inventory changes are equally rare events. Changes in the inventory valuation method (LIFO, FIFO, etc.) require approval by the IRS as well as the auditor.[34] Managers appear to have greater flexibility to change accrual choices. For example, they can accelerate recognition of sales this year and defer recognition in following years, or they can capitalize a repair expenditure this year and expense a similar item next year.

(3) Changes in accounting procedures affect earnings and the threshold defined in the bonus contract in the current and future years. Managers consider the impact of alternative accounting methods on the present value of their bonus awards. However, the effect of a procedure change on the accounting numbers is only publicly disclosed for the year of the change. This information is used to estimate the dollar impact of an accounting change on bonus awards in the year of the change. The proxy therefore fails to control for differences between accounting choices in future years.

Reported changes in accounting procedures are available from two sources: the sample of depreciation switches used by Holthausen (1981) and changes reported by Accounting Trends and Techniques from 1968 to 1980. From these sources, accounting changes are collected for the sample of companies and time-series observations used in Section 6; changes for other firms or years are discarded. The procedure changes are decomposed according to the nature of the change and a summary is presented in Table 7.1. Changes are summarized for the full sample (342) and for the observations whose effect on earnings is disclosed in the footnotes (242).

The impact of each change in accounting procedure on earnings and other accounting numbers is collected from the financial statement footnotes. In 100 cases the effect of the change is described as immaterial or not disclosed. A further 49 changes report only the sign of the impact on earnings. These are coded to indicate whether that impact is positive or negative.

As noted above, casual evidence suggests that it is more costly to implement the decision rule, presented in Section 4, by changing accounting procedures than by changing accruals. Decisions to change accounting procedures are then different in nature from accrual choices; their impact on compensation awards cannot be inferred from the effect of the change in current earnings. Further, the present value impact of the change on earnings is not publicly disclosed. The contingency test methodology adopted in Section 6 is therefore not expected to provide a powerful test of the association between accounting choices and bonus plan incentives.[35]

Table 7.1

Summary and Decomposition of Changes
In Accounting Procedures Sample

Type of Change	Full Sample (342 changes)	Subsample with Effect Disclosed (242 changes)
Miscellaneous	19	12
Inventory		
Miscellaneous	16	9
To LIFO	64	63
To FIFO	3	3
Depreciation		
Miscellaneou	11	6
To accelerated	3	1
To straight-line	27	25
To replacement cost	2	1
Other expenses		
Miscellaneous	20	12
To accrual	12	8
To cash	5	4
Actuarial assumptions for pensions	68	54
Revenue recognition	3	1
Entity accounting		
Miscellaneous	21	8
To inclusion in consolidation	21	1
To equity from unconsolidated	47	34
	342	242
Disclosure of effect on net income		
Effect disclosed		242
Estimate given in dollars	193	
Directional impact reported	49	
Effect undisclosed or described as immaterial		100
		342

An additional test is reported using voluntary changes in accounting procedures as a proxy for the managers' decision variable. This test evaluates the association between bonus plan adoptions or modifications, and voluntary changes in accounting methods, and is independent of the dollar or sign impact of the change on accounting numbers. Watts and Zimmerman (1983) hypothesize that managers select an equilibrium portfolio of accounting methods to report corporate performance. They choose these procedures by trading off "the contracting process effects of different procedures on (their) wealth against the effects which come via the political process."[36] Watts and Zimmerman therefore predict that changes in the contracting or political processes induce managers to change the firm's equilbirium portfolio of accounting methods.

One change in the contracting process is the introduction or modification of a bonus scheme. Managers then have an incentive to change the existing portfolio of accounting procedures to increase the value of their bonus awards. This implies that there will be a greater incidence of voluntary changes in accounting procedures during the year following adoption or modification of a bonus plan, than when there is no such contracting change.

To test whether a higher than normal incidence of voluntary changes in accounting methods is adopted in the year following approval of a bonus plan change, the 121 sample companies are partitioned into one of two portfolios for each of the years 1968 to 1980.[37] The first portfolio comprises companies adopting or modifying the bonus plan; companies in the second subsample have no such contracting change. Bonus plans are adopted or

modified at the annual meeting, which typically occurs three or four months after the fiscal year end. The mean number of voluntary accounting changes per firm reported at the end of the following fiscal year, is presented for both portfolios during each sample year in Table 7.2.[38] A greater number of voluntary changes are expected for the sample of firms adopting or modifying bonus plans, than for firms with no such change. A Sign test is used to evaluate whether the mean number of changes per firm for the sample with a bonus plan change are jointly different from similar estimates for firms with no bonus plan change.[39]

The mean number of voluntary changes in accounting procedures for firms with bonus plan changes is greater than that for firms with no such change in nine of the twelve years.[40] The Sign test implies that the probability of observing this result by change is 0.0730.

Table 7.2

Association between Voluntary Changes in Accounting Procedures and the Adoption or Modification of a Bonus Plan

Year	Mean Number of Voluntary Accounting Changes per Firm: Sample changing bonus plan	Sample not changing bonus plan	Difference
1968	0.6364	0.1161	0.5203
1969	1.0000	0.0932	0.9068
1970	1.3333	0.2250	1.1080
1971	0.2000	0.1780	0.0220
1972	0.2000	0.1102	0.0898
1973	0.2500	0.1739	0.0761
1974	0.5000	0.4132	0.0868
1975	0.4000	0.2458	0.1542
1976	0.5000	0.1818	0.3182
1977	0.0000	0.0250	-0.0250
1978	0.0000	0.0417	-0.0417
1980	0.0000	0.1983	-0.1983
Sign test		0.0730	

These results provide evidence consistent with the hypothesis that changes in bonus schemes provide managers with an incentive to change the equilibrium set of procedures used to report corporate performance. Managers are more likely to voluntarily change accounting procedures following the introduction or modification of a bonus plan.

8. CONCLUSIONS

The evidence presented in this paper suggests that managers select negative accruals when cash flows exceed the formal upper bound specified in the bonus plan. Positive accruals are more likely to be selected when earnings exceed the lower bound specified in the plan and the upper bound is not binding. Finally, when earnings are less than the lower bound managers are more likely to select a negative accrual, consistent with the "big bath" hypothesis. These results support the predictions of the compensation model.

There is an important limitation of the accrual tests: little is known of the relationship between accruals and cash flows from operations in the absence of a compensation plan. It is therefore difficult to exclude the possibility that the results are induced by omitted variables (such as non-accounting effects) which are correlated with the compensation effect.

A test is constructed to compare the distributions of accruals for firms whose bonus plans include an upper bound with the distributions of firms that do not have a plan upper bound. If the impact of omitted (non-accounting) variables on accruals and cash flows is independent of

the inclusion of an upper bound in the bonus contract, these tests isolate differences or similarities in accounting procedure decisions for firms with these different forms of bonus plan. The results are consistent with the predictions of the compensation model.

An additional proxy for the manager's decision variable is also used - voluntary changes in accounting procedures. The contingency tests are replicated using this proxy. However, there are reasons to expect the association between procedure changes and the managers' bonus incentives to be weaker than that for accruals. Firstly, changes in accounting procedures afford managers less flexibility to increase bonus awards than the decisions reflected in accruals. It is costly to change procedures from one year to the next, whereas such decisions as deferral or acceleration of sales recognition can be changed from one year to the next at lower cost. Secondly, the impact of changes in methods is typically publicly disclosed in the year of the change. Bonus plan administrators can then adjust for their effect on bonus awards at lower cost than for less visible accrual decisions. Finally, the proxy focuses on the effect of the accounting change on bonus income in the year of the change; it ignores the impact on future years' bonus awards.

The results of the contingency tests indicate that there is no strong association between changes in accounting procedures and the managers' compensation incentives. Managers do not make annual changes in accounting methods to increase their bonus awards, as predicted by the compensation model. This finding is not surprising, given the above noted limitations of the proxy for the accounting decision variable.

Additional tests indicate that compensation effects are still relevant to the accounting procedures selected to report corporate performance, even though managers do not adjust the firm's accounting methods on an annual basis. A higher incidence of voluntary changes in accounting methods is observed when firms adopt or modify their bonus plan, than when there is no such contractual change.

In summary, the results of the accrual tests are generally consistent with managers using the accounting system to increase their bonus awards. Accruals reflect such accounting decisions as acceleration or deferral of sales recognition, capitalization or expense of repair expenditures, inventory write-downs, and changes in allocation of fixed factory overhead to cost of goods sold and inventories. In addition, the adoption or modification of a bonus plan appears to induce managers to change the set of accounting procedures used to report corporate performance, presumably to increase the value of their bonus awards.

NOTES

1. Refer to Watts (1977) and Watts and Zimmerman (1978).

2. These studies include Watts and Zimmerman (1978), Hagerman and Zmijewski (1979), Holthausen (1981), Zmijewski and Hagerman (1981), Collins, Rozeff and Dhaliwal (1981) and Bowen, Noreen and Lacey (1981).

3. Refer to footnote 2 for a listing of these studies.

4. Refer to Watts and Zimmerman (1983).

5. For a discussion of these types of compensation refer to Smith and Watts (1983).

6. Performance plans assign managers performance units or shares at the beginning of the award period. Performance goals for the period are established, typically in terms of earnings per share, or growth in return on total assets or equity. Managers are awarded the value of these units or shares, either in the form of cash or stock awards, on attaining the goals.

7. The structure of this contract in an given year is analagous to a European call option on reported earnings. At the beginning of each year the exercise price (L_t) is set, and the payoff under the plan depends on the value of earnings (E_t) at year end. The bonus is a linear function of reported income exceeding the threshold.

8. One hundred and twenty-one bonus plans were collected for this study. Only ten of these companies do not match earnings and capital definitions in this way.

9. Contracts taking this form create an incentive for the manager to increase dividend payments when the upper bound becomes binding thereby counteracting the over-retention problem noted in Smith and Watts (1983).

10. The structure of this plan is equivalent to acquisition of a call option on earnings, with exercise price equal to the lower bound (L_t), accompanied by short sale of a call with exercise price set at the upper bound on earnings ($U_t + L_t$).

11. Dividend equivalents are claims which vary with the dividend payments on common stock.

12. Of course, if bonus contracts provide an effective means of reducing incentive problems, their dysfunctional impact on accounting choices are dominated by their positive attributes.

13. The owners of the firm could potentially eliminate the managers' opportunities to select accounting procedures by specifying the accounting technology to be used for bonus purposes in the compensation contract. This is not observed, presumably because it would be costly to implement and enforce. Demski, Patell and Wolfson (1983) offer an alternative explanation for the decentralization of accounting choices, even when compensation contracts are written in terms of earnings: disclosure of accounting choices provides additional information to the owners on the managers' effort. If managers have "access to superior private information which improves the organization's contracting and decision-making opportunities..., owners and managers (will) agree on the desirability of the decentralized choice of monitoring systems by those whose behavior is to be monitored."

14. Holmstrom (1982), p. 210.

15. The results of this two period model are generally unaffected by extension to a multi-period setting. Accounting choices available in each period are a function of the constraints imposed by prior accounting choices, and new accrual opportunities. For example, depreciation decisions in a given year are constrained by prior depreciation charges. The manager nonetheless has some flexibility over how the remaining book value is to be allocated: he can revise the life or salvage estimates or change the method of allocation. Further, new investments provide additional opportunities to modify reported earnings. However, in period N, as in period two in the simpler model, the manager's accounting choices have been predetermined by earlier years' decisions. The manager's decision in years other than N, in an N period world, can then be viewed as analagous to his first year choice in a two period world.

16. Deferral of bonus awards appears to be in the interests of both the owners and managers. It provides a means of offsetting conflicts of interest between the managers and owners arising from their different time horizons with the firm. It also enables the managers and the corporation to minimize the present value of their joint tax payments.

17. Accounting choices affect bonus awards, but these cash effects are assumed to be financed by stock issues or repurchases.

18. Of course, the manager's accrual decision is motivated by factors other than compensation. Watts and Zimmerman (1978) suggest that the manager also considers the impact of accounting choices on taxes, political costs, and the probability and associated costs of violating lending agreements. This paper provides a partial analysis of the impact of bonus plans on accounting choice decisions, that is these other factors are held constant.

19. If no upper bound is included in the compensation contract, Case 1 is unchanged, but when earnings before discretionary accruals exceed the cut-off point, denoted by L', the manager will always select the maximum accrual ($A_1 = K$).

20. Earlier studies have hypothesized that managers have an incentive to smooth earnings, thereby also implying that there will be an association between earnings and accounting choices. For an extensive review of this smoothing literature refer to Ronen and Sadan (1981). The predictions of the compensation model differ from those of the smoothing hypothesis in one important respect: when earnings are less than L', in Figure 4.1, the compensation model predicts that the manager has an incentive to select accounting procedures to deflate income, whereas under the smoothing hypothesis he is expected to inflate income.

21. By selecting firms from this population a size and industry bias is induced. Fox (1980) provides evidence that the probability of a corporation employing a bonus plan is not independent of size or industry. The inferences drawn from this study are strictly limited to the sample population. Nonetheless, that population is a non-trivial one - the largest 250 industrials account for more than 40 percent of sales of all U.S. industrial corporations.

22. The number of company plans collected for each of the years 1930 to 1980 and the number for which usable financial data is available, given this constraint, are documented in Table A-1 in the Appendix.

23. Descriptive statistics for firms whose plans include and exclude an upper bound are presented in Table A-2 in the Appendix. The sample of firms with upper bounds includes these 27 companies. The two samples do not differ substantially in the dimensions reported, namely leverage, size, the ratio of fixed to total assets and systematic risk. F and t statistics are estimated to test whether the variances and means of these financial variables differ statistically for the two samples. None of these statistics is signficant at the .050 level.

24. The earnings variable used to compute the transfer to the bonus pool is typically earnings before the bonus expense. This expense is calculated using the formula outlined in the bonus plan and then is added to the reported earnings number.

25. Accruals are also deflated by sales and the book value of assets at the beginning of the year. The test results are insensitive to alternative size deflators.

26. If this strategy is used to classify observations when the upper bound is binding, the significance of the results for Portfolio UPP is substantially reduced. However, there are two limitations to

using this strategy to classify upper bound observations which do not exist for the lower bound stratification. (1) The model specifies conditions under which reported earnings equal the upper bound. These observations are excluded from the sample if they are classified on the basis of reported income, because there is no way to predict whether accruals are positive or negative. The observations can only be correctly classified by comparing cash flows from operations to the upper bound. (2) The model assumes the managers' choice variable is continuous. If accounting choices are discontinuous, observations can be misclassified around the upper bound. For example, if cash flows from operations exceed the upper bound, the manager may select a smaller accrual than predicted by the compensation model, in which case reported earnings are less than the upper constraint. Partitioning the observations by income then leads to misclassifications and reduces the power of the tests. These misclassifications do not occur around the lower bound.

27. The Chi-Square test assumes that the sample is a random one from the population, and the sample size is large. The statistic is drawn from a Chi-Square distribution with $(R - 1)(C - 1)$ degrees of freedom, where R is the number of rows and C the number of columns in the contingency table.

28. This statistical test assumes that the populations are normal with equal variances. Each t value is then drawn from a t distribution with $(N + M - 2)$ degrees of freedom, where N is the number of observations in one sample and M the number in the other. Malinvaud (1970) discusses the normality assumption, and claims that the significance level of a test of differences in means is not very sensitive to deviations from normality. Both the t test and Chi-Square test assume that accruals are independent. This assumption is violated if accruals are sensitive to market-wide and industry factors. Table A-3 in the Appendix reports autocorrelations for unstandardized accruals. There appears to be a positive first order autocorrelation. This dependency overstates the test statistics.

29. The contingency table for Sample A is replicated after excluding these 27 companies. The results are invariant to deletion of these firms.

30. Results for other subcomponents, and for different plan forms - those with and without an upper bound - are reported in Healy (1983). The upper bound results for depreciation, changes in accounts payable and changes in taxes payable are consistent with the theory, but the lower bound results are inconsistent.

31. The manager then has an incentive to manage inventory levels, as well as to select accounting procedures, to maximize the value of his bonus compensation. Refer to Biddle (1980). Inventory levels are

also determined by inventory holding and order costs, and expected demand.

32. After adding the quadratic term, the residuals are well-specified.

33. The measurement errors in cash flows imply that the coefficient on that variable will be biased. However, there is no reason to expect the dummy variables to be correlated with the measurement errors, in which event their coefficients will be unbiased.

34. The IRS has only permited three repeat changes in inventory method for the sample used in this study.

35. Nonetheless, contingency tests are constructed. To estimate the impact of an accounting change on that year's earnings, the dollar impact on the bonus contract definition of income is compared to the effect on the lower bound. The full impact of the change on income available for bonuses is then defined as the combined effects on earnings and the threshold. The change in accounting procedure observations are assigned to one of Portfolios LOW, MID or UPP using the same stratification adopted in Section 6. As expected the association between the directional impact of the change on bonus awards and compensation incentives is weak.

36. Watts and Zimmerman (1983) Chapter 12, p. 3

37. The sample is limited to the years 1968 to 1980 because a complete set of accounting changes is available only durung this time period. Results are reported for each year separately to ensure that no one year dominates the association.

38. Of course, it is possible that accounting changes and the decision to modify the bonus plan occurred simultaneously at the end of the prior fiscal year. The bonus plan change would then be announced at the annual meeting, but the change in accounting procedures would typically not be publicly disclosed until publication of the annual report at year end.

39. The Sign test assumes that the variable under consideration has a continuous distribution. For a detailed description of the test refer to Siegel (1956) pp. 67-75.

40. No means are reported for 1979 because no sample companies introduced or modified their bonus plan in that year.

REFERENCES

Ball, R. and P. Brown, 1968, An empirical evaluation of earnings numbers, Journal of Accounting Research, Autumn, 159-177.

Biddle, Gary C., 1980, Accounting methods and management decisions: The case of inventory costing and inventory policy, Supplement to the Journal of Accounting and Research, 18, 235-280.

Bowen, Robert M., Eric W. Noreen and John M. Lacy, 1981, Determinants of the corporate decision to capitalize interest, Journal of Accounting and Economics, 3, 151-179.

Collins, Daniel W., Michael S. Rozeff and Dan S. Dhaliwal, 1981, The economic determinants of the market reaction to proposed mandatory accounting changes in the oil and gas industry: a cross-sectional analysis, Journal of Accounting and Economics, 3, 37-72.

Demski, Joel S., James M. Patell and Mark A. Wolfson, 1983, Decentralized choice of monitoring systems, Unpublished paper, Stanford University.

Fama, Eugene F., 1980, Agency problems and the theory of the firm, Journal of Political Economy, 88, 288-307.

Fox, Harland, 1980, Top executive bonus plans, (the Conference Board, New York).

Hagerman, Robert L. and Mark E. Zmijewski, 1979, Some economic determinants of accounting policy choice, Journal of Accounting and Economics, 1, 141-162.

Healy, Paul M., 1983. The impact of bonus schemes on accounting choices, Dissertation, University of Rochester.

Hite, Gailen L. and Michael S. Long, 1980, Taxes and executive stock options, Journal of Accounting and Economics, 4, 3-14.

Holmstrom, Bengt, 1976, Moral hazard and observability, Bell Journal of Economics, 10, 74-91.

Holthausen, Robert W., 1981, Evidence on the effect of bond covenants and management compensation contracts on the choice of accounting techniques: The case of the depreciation switch-back, Journal of Accounting and Economics, 3, 73-109.

Holthausen, Robert W., 1980, Theory and evidence of the effect of bond covenants on the choice of accounting techniques: The case of alternative depreciation methods, Unpublished dissertation, University of Rochester.

Holthausen, Robert W. and Richard Leftwich, 1983, The economic consequences of accounting choices: Implications of costly contracting and monitoring, Unpublished paper, University of Chicago.

Jensen, Michael C. and William H. Meckling, 1976, Theory of the firm: Managerial behavior, agency costs, and capital structure, Journal of Financial Economics, 3, 305-360.

Larcker, David, 1983, The association between performance plan adoption and corporate capital investment, Journal of Accounting and Economics, 5, 3-30.

Malinvaud, E., 1970, Statistical methods of econometrics, (North-Holland/ American Elsvier, Amsterdam/New York).

Miller, Merton H. and Myron S. Scholes, 1980, Executive compensation, taxes and incentives, in Financial economics: Essay in honor of Paul Cootner, W. F. Sharpe and C. M. Cootner (eds), (Prentice-Hall, Englewood Cliffs, New Jersey), 170-201.

Ronen, Joshua and Simcha Sadan, 1981, Smoothing income numbers: Objectives, means, and implications, (Addison-Wesley, Reading, Massachusetts).

Ross, Stephen A., 1973, The economic theory of agency: The principal's problem, American Economic Review, LXIII, June, 434-453.

Siegel, Sidney, 1956, Nonparametric statistics for the behavioral sciences, (McGraw-Hill, New York).

Smith, Clifford and Ross Watts, 1983, The structure of executive compensation contracts and the control of management, Unpublished paper, University of Rochester.

Watts, Ross, 1977, Corporate financial statements, a product of the market and political processes, Australian Journal of Management, April, 53-75.

Watts, Ross and Jerold Zimmerman, 1978, Towards a positive theory of the determination of accounting standards, Accounting Review, January, 112-134.

Watts, Ross and Jerold Zimmerman, 1983, Positive theories of the determination of accounting theories, Unpublished paper, University of Rochester.

Zmijewski, Mark E. and Robert Hagerman, 1981, An income strategy approach to the positive theory of accounting standard setting/choice, Journal of Accounting and Economics, 3, 129-149.

APPENDIX

Table A-1

Number of Bonus Plans Collected and Used from 1930 to 1980

Year	No of plans collected	No of plans with financial data available
1930-37	1	1
1938-40	3	2
1941-45	4	3
1946	5	5
1947-49	9	9
1950	12	12
1951	16	15
1952-53	18	18
1954	24	24
1955	29	27
1956	33	32
1957	36	33
1958	38	35
1959	41	36
1960	44	39
1961	47	43
1962	49	47
1963	52	52
1964	57	56
1965	68	65
1966	78	73
1967	88	84
1968	92	90
1969	99	95
1970-71	101	98
1972	98	97
1973	102	101
1974	96	96
1975	92	92
1976	90	90
1977	82	82
1978	77	77
1979	74	73
1980	69	69

Table A-2

Comparison of Financial Statistics for Firms whose Plans Include and Exclude an Upper Bound

	Leverage		Fixed asset ratio	
	Mean	Variance	Mean	Variance
No upper bound	0.320	0.0290	0.5947	0.1153
Upper bound	0.2753	0.0407	0.5499	0.1005
t test for diff. in means (df = 84)	0.6643		0.6317	
F test for diff. in variances (df = 43, 41)		1.4034		1.1473

	Size ($m)		Beta	
	Mean	Variance	Mean	Variance
No upper bound	2990.4189	2919.3280×10^4	1.1177	0.0799
Upper bound	2759.2930	1905.4880×10^4	1.0649	0.0999
t test for diff. in means (df = 84)	0.2176		0.8224	
F test for diff. in variances (df = 43, 41)		1.5321		1.2503

Leverage is defined as long-term debt to firm value, the fixed asset ratio as net fixed assets to value, and size as the book value of debt and preferred stock and the market value of equity. Each of these financial statistics is computed in 1975 for each company with plan data available in that year. Beta is estimated using the market model methodology. Sixty monthly observations, centered on December 1975, are used for estimation purposes, again for companies with plan data available in 1975. The market index used is a value-weighted portfolio.

Table A-3

Mean Autocorrelations of Accrual and Cash Flow Series

Series	Lag 1	2	3	4	SE
Standardized accrual	0.0271	-0.0434	0.0126	0.0776	0.0318
Unstandardized accrual	0.1245	0.0199	0.0622	0.1041	0.0318
Cash flows	0.4778	0.3395	0.2780	0.1874	0.0318

The standard error is calculated as:

$$\frac{1}{N}\left[\sum_{t=1}^{N}\frac{1}{T_t}\right]^{1/2}$$

where N is the number of companies and T is the number of time series observations for each company.

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Last Page